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# **netWorkPlace Project Report**

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## **Introduction**

The netWorkPlace (nWP) implementation for the CEWES MSRC site demonstrated an early investigative use of online collaboration technology in support of a set of teams of researchers and support staff. The approach was to implement an application suite developed and used at NCSA, and promote its use at CEWES for a variety of collaboration and administrative processes and teams. After approximately one year of use, an analysis of the nWP environment was performed to evaluate its successes and shortcomings, further refine the collaboration requirements of the teams that did and might employ such tools, and drive a decision process on further tool suite implementations. This document looks at the early history of nWP development at NCSA, why it was chosen for early implementation and evaluation at the CEWES MSRC site, the results of the analysis of its actual use, and the implications and recommendations for further customization and tool suites for collaboration.

## **netWorkPlace Origins and Development**

nWP development began in the spring of 1995 as a collaboration between NCSA and Vice-President Gore's National Performance Review (NPR) Office. Initially a loose project to "update the NPR web site," the work quickly evolved into an investigation of a wide range of information dissemination and collaboration requirements faced by the NPR in its effort to push technologies to streamline government and make government agencies, and regulation in general, be more accessible and responsive to citizens. This more general goal was refined for the purposes of the NCSA collaboration to addressing the needs of a set of NPR projects involving virtual teams consisting of federal, state, and local government agencies tasked with assessing options and impacts and making recommendations related to certain government regulations and deregulation initiatives.

Two early requirements for the technology plan were related to scalability of the implemented tools, both in the sense of usability, and customization of spaces without extensive system administrator intervention. The former requirement took the form of making the user interface understandable and usable by the NPR lead's "grandmother in Montana," reflecting the wide range of user experience both with government information and computer/network technology. The latter, although still a prototype development effort, reflected the potentially wide range of requirements of groups that might be users of the environment, and kept as a design goal the flexibility and customization of the tools retained and managed by the groups themselves.

Emerging from this project as an initial prototype used by a small number of NPR partner teams, nWP was a collection of existing collaboration tools integrated with a common user interface and navigation scheme, all accessible from a web browser. The first tool selected for inclusion in nWP was NCSA HyperNews, a threaded discussion capability for organized short correspondence between team members. HyperNews, and threaded discussion in general, offers the advantages of organized discussion, being accessible in an asynchronous (separated in time) fashion by any team member, being persistent in time, and remaining available for any number of users added later. In addition to HyperNews, nWP also included a document repository for saving larger documents (for example, Microsoft Word formatted text documents or Microsoft Excel spreadsheets), a chat server for text based synchronous communication among multiple simultaneously interacting users, and a calendar for scheduling events and notifying users.

A significant development effort for nWP was the graphical user interface, which implemented an "office building" metaphor. This interface was tasked with integrating the tools and providing a framework for

adding additional tools or team spaces. This metaphor was pervasive, from the high levels of providing a lobby with an information desk and building directory for teams and spaces, to floors for individual human teams, to rooms for synchronous and asynchronous meeting spaces (HyperNews and chat), to libraries and file cabinets for document storage, and even to a water cooler for unstructured highly interactive chat. This interface was quite innovative in the sense of sticking closely to the building metaphor and providing a comprehensive navigation scheme to locate and move between different collaborative teams and tools. Certainly it promoted the concept of “space” (room, library, water cooler) as an online “place to go” to have a meeting or do work.

Finally, an nWP design goal from the beginning of the prototype development was to provide team space managers (not system administrators) with tools to add and configure tools and spaces, and to manage users and their access permissions.

### **CEWES MSRC Implementation**

The CEWES MSRC site very early in the program established a focus on collaboration technologies to enhance communication between support personnel, between support staff and high performance computing (HPC) users, and between users. The idea was to capitalize on new online tools to facilitate access to both information and people critical to the task of identifying new application codes and migrating existing codes to new HPC platforms. An inherent dichotomy existed in this effort: one component was to push both the technology while simultaneously pushing relatively unexplored human/social aspects of new collaborative groups, virtual teams, and the building of knowledge repositories.

Because these MSRC goals matched so well those of the NCSA/NPR collaboration, nWP was a natural prototype for a CEWES collaboration environment. By late 1996, the set of tools was reasonably robust and stable, there were no high hurdles to cross in terms of license expenses or server platforms, and the environment could be easily configured and customized for CEWES.

The CEWES collaboration environment under nWP was initially installed and maintained at NCSA. All the existing tools were made part of the initial implementation. The initial use of the space was for PET team weekly meetings, in which all PET CTA and ITC leaders submitted weekly reports in the HyperNews threaded discussion space, which also allowed for some discussion on topics raised by those reports and other topics. This space was called the “Web-a-con and was first used during the first week of March, 1997.

A CEWES MSRC year two Collab/Comm focus project called for moving the nWP environment, then being served and maintained at NCSA, to CEWES platform and management. This involved some changes to the original nWP tool suite. The Lotus Notes backend used for the document repository and the participants database was removed. To replace the functionality provided by Lotus Notes, web CGI interfaces were added for submitting and retrieving documents and for building a participants database.

Modifications to the environment and license issues (related to intellectual property) were resolved in the summer of 1997, and the nWP environment was installed at CEWES in September, 1997. All existing discussions, notes, and documents were moved into the new server environment, and work continued with minimal disruption for the users (the only disruptions were those associated with moving to a new URL, which went very smoothly, and issuing everyone new accounts, which process included only minor glitches. Although spaces were created for some additional CTA teams, and the ability to create additional spaces was advertised to other PET teams, the Web-a-con was the only space used extensively during 1997. And that use had evolved into essentially a common place for posting weekly management reports with occasional trip reports, conference announcements, and other supplemental items.

## Lessons Learned

The nWP system used at CEWES provided a good evaluation testbed for certain types of collaboration processes. The system as installed was relatively easy to maintain and manage. New spaces could be set up as needed with little effort by on-site staff. The user interface was easy to navigate, in the sense of finding one's way to a particular group, space, or submission. Above all, it provided a common place to store documents and other content that was access controlled yet could be reached from all end-user platforms. Once a work process was defined by a group, users had little difficulty in implementing the requirements of that process to provide their information. On the other hand, it was primarily used only by the PET team for status type reports, and some discussion. Application teams or other development groups were not significantly drawn to nWP to solve problems or enhance collaborative efforts. This section draws on this experience and evaluates a number of issues that need to be addressed in any subsequent collaboration environment implementations for CEWES PET teams and efforts.

### User Interface and Usability

As the tools within the nWP environment evolved and needs for additional tools became more apparent, the building metaphor for navigation and organizing spaces became a liability. The metaphor was easy to grasp, but inhibited the implementation, imposing a structure that may have made navigation unnecessarily complex. Although client browser bookmarking was always possible, the building metaphor generally required too many mouse clicks to navigate from space to space, often requiring a half-dozen clicks or more to reach a workspace.

The prevailing thought is that an individually configurable personal workspace capability is far more important than the once prioritized graphical metaphor for navigation. Individual collaborative tools (for a particular application, e.g., HyperNews) perform single functions and do not require complex internal navigation or management. However, for environments currently under consideration for large, distributed organizations such as the MSRC sites and the NSF PACI Alliance, the information design and just sheer number of potentially related collaboration spaces may just be too large to consistently and easily navigate without customization to the users interests and usage patterns. A configurable personal workspace might include the following capabilities:

- Track specific discussions, threads and tasks
- Configure a notification client
- Create shortcuts to frequented workspaces
- Provide consistent, portable tools for the individual's use throughout the environment

Early implementations of nWP suffered from inconsistent user interface and data handling. This is a risk any time multiple tools are integrated, and in nWP's case, was exemplified by the use of Lotus Notes for some tools which handled text differently than tools not based on Lotus Notes. Although the graphical user interface (GUI) could be made similar or identical for these disparate tools, the way data was passed or held by the tools was different enough to make it confusing to the user in some cases. Another way of expressing this is that because of the similar GUI, users often supplied information to the tools similarly, but that input was accepted by some tools and rejected by others.

Another level of user interface issue is the high dependence on interactive web access to perform useful work tasks. Making use of "airplane time" is often of importance to the contemporary information user, and web-only access to information repositories is problematic. Users find it convenient to carry their personal documents and email repositories with them, allowing a certain degree of asynchronous interaction with others. But collaborative spaces do not lend themselves to easily provide copies for laptop use. Some of this can be addressed by selective replication of collaborative databases, as well as easy email interfaces to discussion spaces.

## Tools

The principal tool of nWP, and the one most used at CEWES, was the NCSA HyperNews threaded discussion capability. In order to integrate HyperNews into the environment, its email interface was disabled. This capability is a frequent request of users, and needs to be integrated into any follow-on tool.

The document repository capability was used very little in the CEWES environment, and should probably be given a lower priority in a future implementation. The Alliance intranet space has experienced a similar use pattern, and the developers are planning to integrate the document repository with the threaded discussion space there. However, managing documents within the space continues to be important, and the significant requested capabilities for documents include:

- Handle documents created outside the environment
- Handle documents of various types, formats and applications
- Easily handle upload and download
- Allow file locking
- Provide revision history for collaborative authoring

The calendar underwent significant customization by the original nWP developers to make it easy to distinguish types of events. However, the calendar was infrequently used at CEWES as well. A decision needs to be made on the extent to which calendar and scheduling capabilities will, or can, be pushed among virtual teams. For example, a full scheduling calendar capability is likely not to be used by those whose home sites already have a well defined meeting scheduling process (whether electronic or not). Current tools are likely not possible candidates for integration with such arbitrary home processes, and treating a calendar as a simple events list of items of interest to a wide range of team members is likely the limit of capability that makes sense.

## File Management

One big difference between the nWP collaborative spaces and a traditional web server is that the users responsible for nWP content (discussions and documents) do not have as much control over the views and indexes of that content. In other web environments, if a content provider can present links to documents in a more useful, organized way, it is more simply a matter of applying a new information design and/or modifying HTML and other files. But nWP presents a more rigid framework for the views of the indexes to other documents and it is less easy or impossible to make structural or aesthetic changes to those views. A specific instance of this problem occurs with the Web-a-cons, where the lists of active weekly meetings/discussions get so long that easy access to current discussions is impaired. An additional structure is required that allows older discussions to be archived in a way that they remain accessible but do not impair the easy access to the most frequently requested information. Some capability is required to support direct user intervention in file management, as well as the ability to modify information structures to suit team requirements.

## Notification

nWP, and other groupware suites, offer the advantage of a standard mechanism for sharing documents across multiple locations, networks, workstation platforms and operating system environments. However, with the rapid proliferation of accessible information sources, a common complaint about the nWP environment at CEWES and elsewhere, as well as other asynchronous collaboration environments, concerns the issue of notification. nWP can have many collaborative spaces defined, with some users reasonably having access to several discussion, document, or other meeting spaces. Whether or not these spaces are physically distributed among multiple servers, the process of checking individual spaces for interesting activity, let alone required responses, can be very time consuming at best, and typically results in frustration and low activity.

What is needed is a facility to allow easy tracking of discussions and other spaces of interest. This can be implemented through a personalized "home page" which lists information about spaces of interest and

provides easy single click access to them. Alternately, a more active notification scheme could be implemented to provide similar information either synchronous with some event, such as a post requiring urgent action or controlled by the poster, or more automatically with either synchronous or daily summary type information.

#### User Administration

A focus of the early nWP development for NPR was in providing collaborative team leader management of spaces. This consists of allowing the team leader (not a system administrator) to specify what tools should be a part of a space, and managing user access permissions to those tools. This capability was only partially implemented within nWP, and not utilized at CEWES, although the need was not great given use by a limited number of teams and applications.

#### Security

A big issue facing the NCSA/Alliance collaboration environment concerns user access. Some teams want to restrict access to just those people actively participating in a project. Other groups and applications need to have or encourage widespread dissemination and participation, requiring little or no access control. The proper mix of these “public” and “private” spaces is very important to consider from the beginning of the project to define some standards and tools to provide users with an understanding of who has access to notes or documents posted to the space. Without this understanding, most users will be reluctant to post many items. This requires a careful management assessment of the uses for various types of information.

### **Collaboration Environment and nWP Recommendation**

A good deal of experience has been gained through the early evaluations and initial implementations of nWP collaborative environments. Both technical and social/human issues need to be addressed. Below we will discuss the hardware and software platform issues, considerations for tools to be used, and how human teams and applications can be integrated into the framework.

#### Hardware/Software Platform

Central to the selection of a framework for collaborative tools is the definition of the hardware and software that will be used both on the server and client sides. nWP represents an early effort to design and build a web-based collaborative tools framework, primarily to study what was involved in building such a framework and how it would be used in a variety of user settings. At the time of its design, there were no commercial alternatives; a number of disparate tools (web browsers, threaded discussions, even MUDs and MOOs were prevalent) were available both commercially and as freeware/shareware. However, no integrated sets of tools were available that depended only on the open standards and protocols of TCP/IP and the World Wide Web. A very small number of collaboration tools, and sets of tools, or groupware, existed at the time, notably Lotus Notes, but as with Notes, these were usually very closed environments requiring vendor supplied server and client side software, and having a restricted set of proprietary API's for adding additional functionality. NCSA had a strategic interest in pursuing open network application environments, and wanted to build on the success of the WWW protocol that had been given a tremendous boost with the introduction of the multimedia NCSA Mosaic web browser a couple of years earlier.

Since that time, commercial software vendors have embraced the web as a standard medium for a wide variety of client/server type applications. Old and new firms have introduced a plethora of internet and web tools, while traditional client/server and groupware vendors have quickly adapted their applications for integration with web servers and browsers. This explosion in network-based applications opened up a variety of new capability, an ability to integrate that new capability with many legacy applications, and an interest among users to expand the scope of electronic information dissemination and management. Groupware applications also have benefited from this strong move to the internet standards. As a result, it is no longer necessary to develop such applications from the ground up to satisfy basic collaboration and information management requirements. The advantages of commercial software include more reliable and

robust software, better documentation, and the ability to leverage the talents and development dollars possible with a large market product. From an academic point of view, however, there is still much to be learned in how available tools can be tied together and optimized for new sets of user requirements.

Thus, in 1997, NCSA made the decision to implement a collaboration environment for asynchronous discussions and document sharing (among other applications) built with commercial software components. Lotus Notes was selected after an evaluation based on its strong security and user roles model, initial offering and commitment to true web protocols and server, flexible development model built on backend databases and presentation views, and robust server administration and management capabilities including distributed and cluster configurations, database replication, and integration of tools. In addition, Notes offers excellent cross-platform support, with both server and client packages (still necessary for some development roles) available for Windows (95 and NT), Unix, and Apple Macintosh systems.

Development and customization work ongoing at NCSA, and still required of almost any Notes (or other commercial) environment, consists of selecting appropriate tools, customizing interfaces, navigation, and presentation views, and building some applications and user interfaces using Notes and external databases with Notes views or java user interfaces. There is also a good selection of third party tools and applications that can be integrated easily into a Notes environment.

We recommend that CEWES begin to deploy collaboration tools based on a Lotus Notes foundation. Reasons for this selection mirror the criteria and evaluation done by NCSA for its Alliance Intranet. Furthermore, CEWES can leverage the NCSA expertise as well as specific tool evaluation, selection, integration and customization work done.

#### Tools

We further recommend that CEWES track the Alliance Intranet tool set, with appropriate customization to meet the specific needs of CEWES user groups and applications. The initial tool set to be implemented would consist of a threaded discussion capability and document repository or library, probably tightly coupled. In addition, we would implement an events list tool for presenting calendar type views of meetings, training, and other events of common interest with interfaces for submitting and accessing information about the events. A search capability will be implemented to allow user searching of the entire Notes environment, providing easy links to notes and documents that match search criteria and user access permissions. Finally, a user customization feature will be implemented to provide an initial notification capability to ease the tracking of multiple collaboration spaces of interest.

The limited tool set described above represents only an initial offering. The security and document framework of the Notes environment can be the basis for additional tools both inside and “nearby” the Lotus Notes server itself. In particular, synchronous collaboration tools can be evaluated at CEWES for selected applications. Of particular interest would be audio and video teleconferencing as well as specifications for integration of more focused HPC capabilities such as collaborative visualization tools. Resources applied to work in these areas would have to be balanced against the desire to build applications based on the tools, such as particular workflow processes, collaborative document authoring, or others as identified by CEWES collaborative teams.

In selecting and customizing these tools, it will be critical to maintain a working relationship between the user team(s) and those responsible at NCSA for the initial tool implementation and customization. We have learned that this is necessary to actually learn how users use these collaboration spaces and the bottlenecks and frustrations they experience in everyday use of the tools. Overcoming these obstacles in a timely fashion is a step that was not implemented well in the nWP project, but will be critical to moving from a small number of initial teams to a wider CEWES MSRC utilization.

#### Project Support Requirements

Implementing a Lotus Notes collaborative framework will require a commitment by the CEWES MSRC to support Notes expertise and maintenance and light development responsibilities on site. The initial



environment can be set up, configured and maintained at NCSA. After approximately a six month period, it should be moved to a CEWES system with support provided by CEWES staff. NCSA would, at that time, continue to be involved in providing new tools and assistance in their installation and configuration. However, there will be many administrative duties, such as user and routine tool creation and configuration, that would be handled at CEWES.

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